FOREST PEST MANAGEMENT
Pacific Southwest Region

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WESTERN DWARF MISTLETOE IN THE PIUTE MOUNTAINS, SEQUOIA NATIONAL FOREST

John Pronos
Service Area Plant Pathologist

Background

Several stands in the Piute Mountains, which are part of the Greenhorn Ranger District, were evaluated for dwarf mistletoe conditions on August 29, 1996. Present were Lew Jump and Linda Brett, Sequoia National Forest SO; Ray Huber, Cannell Meadow RD; and myself. Our objectives were to assess the distribution and severity of western dwarf mistletoe (Arceuthobium campylopodum) and determine the best course of action for management of this pathogen.

At question is most of the eastern portion of the Piute Mountains where heavy logging in the 1800's for mining timber and subsequent overstory removals in the 1950's and 60's have left many stands with serious dwarf mistletoe problems. Most of the area is low site quality (Dunning 4) and almost pure Jeffrey pine. We estimated that dwarf mistletoe is irregularly distributed over 10,000 to 15,000 acres. The severity of infection also varies greatly. Many stands have average Hawksworth ratings of over 3. Unfortunately, some of the existing pine stands do not contain merchantable trees and cannot generate any revenue needed for treatment.

A second concern involves young (less than 10 years old) pine plantations resulting from clearcuts to control dwarf mistletoe that still contain sub-merchantable infected advanced regeneration. Planted seedlings are not currently infected, and it is important to remove the overstory source of mistletoe seed. (Management of this pathogen is based on its biology which is summarized at the end of this report.) Options in such situations include removal or girdling infected trees. Aggregations of residuals can be sanitized by thinning if mistletoe infections are light to moderate. Pruning can be effective where retention of advanced regeneration is important and mistletoe is restricted to the lower one-third of the live crown. In some situations, pines adjacent to plantations may be infected. This would require extending suppression activities into the adjoining stand to create a buffer that would minimize movement of dwarf mistletoe into the plantation.

Discussion/FPM Funding

Historically, the Greenhorn RD has harvested approximately 2000 acres/decade in the Piute Mountains. Within the next year, they will begin planning their next entry. Inventory data is not available to help the District identify which stands are in the greatest need of mistletoe suppression. Although dwarf mistletoe builds up slowly, addressing only 2000 acres each decade when over 10,000 acres are affected is not adequate.

My suggestion is for the District to make two separate requests for Forest Pest Management suppression funds. One would address treating infected residuals in plantations, and the second would be for pre-suppression surveys designed to provide the information for setting treatment priorities in future entries.

FPM funds cannot be used to replace normal timber management funding, but can be used to supplement funding or to implement activities where funds are nonexistent. Suppression proposals must include: (1) an FPM evaluation that supports the project (this report); (2) form FS-3400-2, Forest Pest Management Project Proposal signed by the appropriate line officer; and (3) a brief narrative stating project objectives, the targeted insect or pathogen and the number of acres involved. The project must be supported by proper NEPA documentation that includes an economic analysis (production function) showing benefits and costs of each alternative. This NEPA analysis and the project work plan will be reviewed here in the Service Area office. Project proposals requesting FY97 funds must be received by us in Sonora by October 25, 1996.

Biology of Western Dwarf Mistletoe

Dwarf mistletoes (Arceuthobium spp.) are parasitic, flowering plants that can only survive on living conifers in the Pinaceae. They obtain most of their nutrients and all of their water and minerals from their hosts. Western dwarf mistletoe (A. campylopodum) infects principally ponderosa, Jeffrey, and knobcone pines, and occasionally Coulter and lodgepole pines.

Dwarf mistletoes spread by means of seed. In the fall the fruit ripen and fall from the aerial shoots. The seeds are forcibly discharged. The seed is covered with a sticky substance and adheres to whatever it contacts. When a seed lands in a host tree crown, it usually sticks to a needle or twig, where it remains throughout the winter. The following spring the seed germinates and penetrates the twig at the base of the needle. For the next 2-4 years, the parasite grows within the host tissues, developing a root-like system within the inner bark and outer sapwood, and causing the twig or branch to swell. Aerial shoots then develop and bear seed in another 2-4 years.

Dispersal of dwarf mistletoe seeds is limited to the distance the seeds travel after being discharged. From overstory to understory, this is usually 20 to 60 feet, but wind may carry them as far as 100 feet from the source. A rule of thumb is that the seeds can travel a horizontal distance equal to the height of the highest plant in an infected tree. There is some evidence that long distance spread of dwarf mistletoe is occasionally vectored by birds and animals.

Vertical spread within tree crowns of most dwarf mistletoes is limited to less than one foot per year because of foliage density. Because of the thin crowns of Digger pine, however, the vertical rate of spread has been measured as being greater than 2 feet per year. This rate of spread equalled or exceeded the rate of height growth of infected trees.

Dwarf mistletoes are easy to identify because they are generally exposed to view within a tree's crown. Signs of infection include the yellow-green to orange mistletoe plants, basal cups on a branch or stem where the plants were attached, and detached plants on the ground beneath an infected tree. Symptoms include spindle-shaped branch swellings, witches' brooms in the lower crown, and bole swellings.

Growth and Mortality Data: The tables below show how dwarf mistletoes affect ponderosa pines. This data is from Hawksworth, F.G., et. al., "Interim dwarf mistletoe impact modeling system - User's guide and reference manual". USDA Forest Service, Methods Application Group, Fort Collins, CO, Report MAG-91-3, March 1992, 90p.

Table 1. Ten-year growth reductions in ponderosa pine based on Hawksworth mistletoe rating.

HAWKSWORTH MISTLETOE RATING:	0	1	2	3	4	5	6
10-YEAR DIAM GROWTH REDUCTION (PERCENT)	0	0	0	2	14	27	50

Table 2. Ten-year mortality percentages for ponderosa pine based on Hawksworth rating and tree size.

HAWKSWORTH MISTLETOE RATING:	0	1	2	3	4	5	6
% MORTALITY TREES <9" DBH	0.0	1.2	3.9	8.8	16.0	25.4	37.0
% MORTALITY TREES >9" DBH	0.0	1.0	3.3	7.4	13.3	21.2	30.9